IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of:	)	
	)	
Lee et al.	)	Group Art Unit: 2871
	)	
Serial No.: 10/621,881	)	Examiner: Duong, Tai V.
	)	
Filed: July 17, 2003	)	Confirmation No.: 8404
	)	
For: **LIQUID CRYSTAL DISPLAY DEVICE AND FABRICATION METHOD THEREOF**	)	TKHR Docket: 250806-1300 Top-Team: 0611-10007US
	)	

AMENDMENT AND RESPONSE TO OFFICE ACTION

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Sir:

The Office Action mailed March 23, 2006 has been carefully considered. In response thereto, please enter the following amendments and consider the following remarks.

AMENDMENTS

In the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (currently amended) A liquid crystal display device, comprising:

a first substrate and a second substrate opposing each other;

a liquid crystal layer formed between the first substrate and the second substrate;

a plurality of scanning bus lines and a plurality of data bus lines arranged in a matrix form to define a plurality of pixel areas;

a plurality of TFT devices formed in the plurality of pixels, respectively; and

a plurality of pixel electrode layers formed in the plurality of pixels, respectively;

wherein, in each pixel area, the pixel electrode layer is formed between a first data bus line and a second data bus line; and

wherein, in each pixel area, a first space between the first data bus line and [[the] a periphery of the pixel electrode layer is ~~different from a second space between the second data bus line and the periphery of the pixel electrode layer.~~ a liquid crystal reverse region, and a second space between the second data bus line and a periphery of the pixel electrode is a liquid crystal non-reverse region, and

wherein, the first space is larger than the second space.

2. (currently amended) The liquid crystal display device as claimed in claim 1, further comprising:

an alignment film of a rubbing direction in the plurality of pixels, respectively;

wherein, ~~when~~ an included angle between the rubbing direction and the data bus line is 40~50 degrees~~, the first space between the first data bus line and the periphery of the pixel electrode layer is a liquid crystal reverse region, and the second space between the second data bus line and the periphery of the pixel electrode is a liquid crystal non-reverse region; and~~

~~wherein, the first space adjacent to the liquid crystal reverse region is larger than the second space adjacent to the liquid crystal non-reverse region~~.

3. (original) The liquid crystal display as claimed in claim 2, wherein the first space is 4~5μm and the second space is 2~3μm.

4. (original) The liquid crystal display device as claimed in claim 1, further comprising:

an opaque layer overlapping the first data bus line, the second data bus line, the first space and the second space; and

a plurality of light-shielding layers formed in the plurality of pixel areas, respectively;

wherein, in each pixel area, a first light-shielding layer is formed between the first data bus line and the periphery of the pixel electrode layer; and

wherein, in each pixel area, a second light-shielding layer is formed between the second data bus line and the periphery of the pixel electrode layer; and

wherein, a first overlapping width is defined between the opaque layer and the first light-shielding layer, and a second overlapping width is defined between the opaque layer and the second light-shielding layer.

5. (original) The liquid crystal display as claimed in claim 4, wherein the first overlapping width is equal to the second overlapping width.

6. (original) The liquid crystal display as claimed in claim 4, wherein the first overlapping width is different from the second overlapping width.

7. (original) The liquid crystal display device as claimed in claim 6, further comprising:

an alignment film of a rubbing direction formed in the plurality of pixels, respectively;

wherein, when an included angle between the rubbing direction and the data bus line is 40~50 degrees, the first space between the first data bus line and the periphery of the pixel electrode layer is a liquid crystal reverse region, and the second space between the second data bus line and the periphery of the pixel electrode is a liquid crystal non-reverse region; and

wherein, the first overlapping width adjacent to the liquid crystal reverse region is larger than the second overlapping width adjacent to the liquid crystal non-reverse region.

8. (original) The liquid crystal display as claimed in claim 7, wherein the first overlapping width is 6.5~7.5μm and the second overlapping width is 4.5~5.5μm.

9. (original) The liquid crystal display device as claimed in claim 4, wherein the second substrate further comprises:

a gate insulating layer formed overlying the second substrate and covering the scanning bus lines and the light-shielding layers, in which the data bus lines are formed overlying the gate insulating layer; and

a passivation layer formed overlying the gate insulating layer and covering the data bus lines, in which the pixel electrode layers are formed overlying the passivation layer.

10. (original) The liquid crystal display as claimed in claim 1, wherein the first substrate further comprises a color filter layer and a common electrode layer.

11. (original) A liquid crystal display device, comprising:

a first substrate and a second substrate opposing to each other;

a liquid crystal layer formed between the first substrate and the second substrate;

a plurality of scanning bus lines and a plurality of data bus lines arranged in a matrix form to define a plurality of pixel areas;

a plurality of TFT devices formed in the plurality of pixels, respectively;

a plurality of pixel electrode layers formed in the plurality of pixels, respectively;

a plurality of light-shielding layers formed in the plurality of pixel areas overlying the second substrate, respectively; and

an opaque layer formed overlying the first substrate;

wherein, in each pixel area, the pixel electrode layer is formed between a first data bus line and a second data bus line, in which a first distance is kept between the first data bus line and the

periphery of the pixel electrode layer, and a second space is kept between the second data bus line and the periphery of the pixel electrode layer;

wherein, in each pixel area, a first light-shielding layer is formed between the first data bus line and the periphery of the pixel electrode layer, and a second light-shielding layer is formed between the second data bus line and the periphery of the pixel electrode layer;

wherein, the opaque layer overlaps the first data bus line, the second data bus line, the first space and the second space;

wherein, in each pixel area, a first overlapping width between the opaque layer and the first light-shielding layer is different from a second overlapping width between the opaque layer and the second light-shielding layer.

12. (original) The liquid crystal display device as claimed in claim 11, further comprising:

an alignment film of a rubbing direction formed in the plurality of pixels, respectively;

wherein, when an included angle between the rubbing direction and the data bus line is 40~50 degrees, the first space between the first data bus line and the periphery of the pixel electrode layer is a liquid crystal reverse region, and the second space between the second data bus line and the periphery of the pixel electrode is a liquid crystal non-reverse region; and

wherein, the first overlapping width adjacent to the liquid crystal reverse region is larger than the second overlapping width adjacent to the liquid crystal non-reverse region.

13. (original) The liquid crystal display as claimed in claim 12, wherein the first overlapping width is 6.5~7.5μm and the second overlapping width is 4.5~5.5μm.

14. (original) The liquid crystal display as claimed in claim 11, wherein the first space is equal to the second space.

15. (original) The liquid crystal display as claimed in claim 11, wherein the first space is different from the second space.

16. (original) The liquid crystal display device as claimed in claim 15, further comprising:

an alignment film of a rubbing direction formed in the plurality of pixels, respectively;

wherein, when an included angle between the rubbing direction and the data bus line is 40~50 degrees, the first space between the first data bus line and the periphery of the pixel electrode layer is a liquid crystal reverse region, and the second space between the second data bus line and the periphery of the pixel electrode is a liquid crystal non-reverse region; and

wherein, the first space adjacent to the liquid crystal reverse region is larger than the second space adjacent to the liquid crystal non-reverse region.

17. (original) The liquid crystal display as claimed in claim 16, wherein the first overlapping width is 4~5μm and the second overlapping width is 2~3μm.

18. (original) The liquid crystal display device as claimed in claim 11, wherein the second substrate further comprises:

a gate insulating layer formed overlying the second substrate and covering the scanning bus lines and the light-shielding layers, in which the data bus lines are formed overlying the gate insulating layer; and

a passivation layer formed overlying the gate insulating layer and covering the data bus lines, in which the pixel electrode layers are formed overlying the passivation layer.

19. (original) The liquid crystal display as claimed in claim 11, wherein the first substrate further comprises a color filter layer and a common electrode layer.

20. (currently amended) A fabrication method for a liquid crystal display device, comprising steps of:

providing a first substrate;

forming a plurality of scanning bus lines and a plurality of light-shielding layers overlying the first substrate;

forming a gate insulating layer overlying the first substrate to cover the scanning bus lines and the light-shielding layers;

forming a plurality of data bus lines overlying the gate insulating layer, in which the data bus lines and the scanning bus lines are arranged in a matrix form to define a plurality of pixel areas;

forming a plurality of TFT devices in the plurality of pixels, respectively; and

forming a plurality of pixel electrode layers overlying the passivation layer in the plurality of pixels, respectively;

wherein, in each pixel area, the pixel electrode layer is formed between a first data bus line and a second data bus line; and

wherein, in each pixel area, [[the]] a periphery of the pixel electrode layer is ~~different from a second space between the second data bus line and the periphery of the pixel electrode layer.~~ a

liquid crystal reverse region, and a second space between the second data bus line and a periphery of the pixel electrode is a liquid crystal non-reverse region; and

wherein, the first space is larger than the second space.

21. (currently amended) The fabrication method for a liquid crystal display device as claimed in claim 20, further comprising a step of:

forming an alignment film of a rubbing direction overlying the pixel electrode and the passivation layer;

wherein, ~~when~~ an included angle between the rubbing direction and the data bus line is 40~50 degrees~~, the first space between the first data bus line and the periphery of the pixel electrode layer is a liquid crystal reverse region, and the second space between the second data bus line and the periphery of the pixel electrode is a liquid crystal non-reverse region; and~~

~~wherein, the first space adjacent to the liquid crystal reverse region is larger than the second space adjacent to the liquid crystal non-reverse region~~.

22. (original) The fabrication method for a liquid crystal display device as claimed in claim 21, wherein the first space is 4~5μm and the second space is 2~3μm.

23. (original) The fabrication method for a liquid crystal display device as claimed in claim 20, further comprising steps:

providing a second substrate opposing to the first substrate; and

forming an opaque layer overlying the second substrate, in which the opaque layer overlaps the first data bus line, the second data bus line, the first space and the second space;

wherein, in each pixel area, the first light-shielding layer is formed between the first data bus line and the periphery of the pixel electrode layer;

wherein, in each pixel area, the second light-shielding layer is formed between the second data bus line and the periphery of the pixel electrode layer; and

wherein, a first overlapping width is defined between the opaque layer and the first light-shielding layer, and a second overlapping width is defined between the opaque layer and the second light-shielding layer.

24. (original) The fabrication method for a liquid crystal display as claimed in claim 23, wherein the first overlapping width is equal to the second overlapping width.

25. (original) The fabrication method for a liquid crystal display as claimed in claim 23, wherein the first overlapping width is different from the second overlapping width.

26. (original) The fabrication method for a liquid crystal display as claimed in claim 25, further comprising a step of:

forming an alignment film of a rubbing direction overlying the pixel electrode layer and the passivation layer;

wherein, when an included angle between the rubbing direction and the data bus line is 40~50 degrees, the first space between the first data bus line and the periphery of the pixel electrode layer is a liquid crystal reverse region, and the second space between the second data bus line and the periphery of the pixel electrode is a liquid crystal non-reverse region; and

wherein, the first overlapping width adjacent to the liquid crystal reverse region is larger than the second overlapping width adjacent to the liquid crystal non-reverse region.

27. (original) The fabrication method for a liquid crystal display as claimed in claim 26, wherein the first overlapping width is 6.5~7.5μm and the second overlapping width is 4.5~5.5μm.

28. (original) The fabrication method for a liquid crystal display as claimed in claim 23, further comprising steps of:

forming a color filter layer overlying the second substrate;

forming a common electrode layer overlying the color filter layer and the opaque layer; and

forming an alignment layer overlying the common electrode layer.

29. (original) The fabrication method for a liquid crystal display as claimed in claim 23, further comprising a step of forming a liquid crystal layer between the first substrate and the second substrate.

30. (original) A fabrication method for a liquid crystal display device, comprising steps of:

providing a first substrate;

forming a plurality of scanning bus lines and a plurality of light-shielding layers overlying the first substrate;

forming a gate insulating layer overlying the first substrate to cover the scanning bus lines and the light-shielding layers;

forming a plurality of data bus lines overlying the gate insulating layer, in which the data bus lines and the scanning bus lines are arranged in a matrix form to define a plurality of pixel areas;

forming a plurality of TFT devices in the plurality of pixels, respectively;

forming a plurality of pixel electrode layers overlying the passivation layer in the plurality of pixels, respectively;

providing a second substrate opposing to the first substrate; and

forming an opaque layer overlying the second substrate;

wherein, in each pixel area, the pixel electrode layer is formed between a first data bus line and a second data bus line; and

wherein, in each pixel area, a first space is kept between the first data bus line and the periphery of the pixel electrode layer, and a second space is kept between the second data bus line and the periphery of the pixel electrode layer; and

wherein, in each pixel area, a first light-shielding layer is formed between the first data bus line and the periphery of the pixel electrode layer, and a second light-shielding layer is formed between the second data bus line and the periphery of the pixel electrode layer; and

wherein, the opaque layer overlaps the first data bus line, the second data bus line, the first space and the second space; and

wherein, a first overlapping width between the opaque layer and the first light-shielding layer is different from a second overlapping width between the opaque layer and the second light-shielding layer.

31. (original) The fabrication method for a liquid crystal display device as claimed in claim 30, further comprising a step of:

forming an alignment film of a rubbing direction overlying the pixel electrode and the passivation layer;

wherein, when an included angle between the rubbing direction and the data bus line is 40~50 degrees, the first space between the first data bus line and the periphery of the pixel electrode layer is a liquid crystal reverse region, and the second space between the second data bus line and the periphery of the pixel electrode is a liquid crystal non-reverse region; and

wherein, the first overlapping width adjacent to the liquid crystal reverse region is larger than the second overlapping width adjacent to the liquid crystal non-reverse region.

32. (original) The fabrication method for a liquid crystal display device as claimed in claim 31, wherein the first space is 6.5~7.5μm and the second space is 4.5~5.5μm.

33. (original) The fabrication method for a liquid crystal display as claimed in claim 30, wherein the first space is equal to the second space.

34. (original) The fabrication method for a liquid crystal display as claimed in claim 30, wherein the first space is different from the second space.

35. (original) The fabrication method for a liquid crystal display as claimed in claim 34, further comprising a step of:

forming an alignment film of a rubbing direction overlying the pixel electrode layer and the passivation layer;

wherein, when an included angle between the rubbing direction and the data bus line is 40~50 degrees, the first space between the first data bus line and the periphery of the pixel electrode layer is a liquid crystal reverse region, and the second space between the second data bus line and the periphery of the pixel electrode is a liquid crystal non-reverse region; and

wherein, the first space adjacent to the liquid crystal reverse region is larger than the second space adjacent to the liquid crystal non-reverse region.

36. (original) The fabrication method for a liquid crystal display as claimed in claim 35, wherein the first overlapping width is 4~5μm and the second overlapping width is 2~3μm.

37. (original) The fabrication method for a liquid crystal display as claimed in claim 30, further comprising steps of:

forming a color filter layer overlying the second substrate;

forming a common electrode layer overlying the color filter layer and the opaque layer; and

forming an alignment layer overlying the common electrode layer.

38. (original) The fabrication method for a liquid crystal display as claimed in claim 30, further comprising a step of forming a liquid crystal layer between the first substrate and the second substrate.

REMARKS

The Examiner is thanked for the thorough examination of the present application, the allowance of claims 11-19 and 30-38, and the indication that claims 6-8 and 25-27 contain allowable subject matter. Claims 1-38 remain pending in the present application. Claims 1, 2, 20 and 21 have been amended. For at least the reasons that follow, Applicant submits that all claims are now in condition for allowance.

Rejections Under 35 U.S.C. 102(e) of Claim 1

Claim 1 was tentatively rejected under 35 U.S.C. 102(e) as being unpatentable by Yee et al (USPN 2002/0171782, hereinafter "Yee"). In this regard, the Office Action that Yee discloses a liquid crystal display device as claim 1.

As amended, independent claim 1 recites:

> 1. A liquid crystal display device, comprising:
> a first substrate and a second substrate opposing each other;
> a liquid crystal layer formed between the first substrate and the second substrate;
> a plurality of scanning bus lines and a plurality of data bus lines arranged in a matrix form to define a plurality of pixel areas;
> a plurality of TFT devices formed in the plurality of pixels, respectively; and
> a plurality of pixel electrode layers formed in the plurality of pixels, respectively;
> wherein, in each pixel area, the pixel electrode layer is formed between a first data bus line and a second data bus line; and
> wherein, in each pixel area, a first space between the first data bus line and a periphery of the pixel electrode layer is ***a liquid crystal reverse region***, and a second space between the second data bus line and a periphery of the pixel electrode is ***a liquid crystal non-reverse region***, and
> wherein, ***the first space is larger than the second space***.

(Emphasis Added). Claim 1 patently defines over the cited reference for at least the reason that the cited reference fails to teach the features emphasized above.

As is clearly recited in claim 1, claim 1 comprises **a liquid crystal reverse region (the first space)**

and a liquid crystal non-reverse region (the second space). Wherein, **the first space is larger than the second space.**

Although Yee discloses in paragraph [0016] that a distance "a" between the data line 52 and the pixel electrode 54 on the left is smaller than a distance "b" between the data line 52 and the pixel electrode 54 on the right side, Yee does not disclose that a first space belonging to a liquid crystal reverse region is larger than a second space belonging to a liquid crystal non-reverse region.

Accordingly, the liquid crystal display device in claim 1 is clearly and patently different from the liquid crystal display device in Yee, for at least the reason that **Yee does not teaches that the liquid crystal reverse region is larger than the liquid crystal non-reverse region.** Reconsideration of this rejection is hereby respectfully requested.

Applicant respectfully submits that the reference (Yee et al) does not teach at least the features /limitation emphasized here in claim 1. Therefore, Applicant respectfully submits that claim 1 is in condition for allowance.

Rejections Under 35 U.S.C. 103(a) of Claims 1 and 20

Claims 1 and 20 were tentatively rejected under 35 U.S.C. 103(a) as allegedly unpatentable over Applicant's prior art in view of Yee et al (US 2002/0171782, hereinafter "Yee"). Claim 1 and 20 are independent claims, from which claims 2-10 and 21-29 depend. Applicant submits that claims 1 and 20 are patentable for the reasons discussed below, and therefore for at least the same reasons claims 2-10 and 21-29 are patentable.

The Office Action asserts that the combination of APA and Yee discloses a LCD device and fabrication method as defined claims 1 and 20. Applicant respectfully disagrees.

As amended, independent claim 1 recites:

> 1. A liquid crystal display device, comprising:
> a first substrate and a second substrate opposing each other;
> a liquid crystal layer formed between the first substrate and the second substrate;
> a plurality of scanning bus lines and a plurality of data bus lines arranged in a matrix form to define a plurality of pixel areas;
> a plurality of TFT devices formed in the plurality of pixels, respectively; and
> a plurality of pixel electrode layers formed in the plurality of pixels, respectively;
> wherein, in each pixel area, the pixel electrode layer is formed between a first data bus line and a second data bus line; and
> wherein, in each pixel area, a first space between the first data bus line and a periphery of the pixel electrode layer is ***a liquid crystal reverse region***, and a second space between the second data bus line and a periphery of the pixel electrode is ***a liquid crystal non-reverse region***, and
> wherein, ***the first space is larger than the second space***.

(Emphasis Added) Claim 1 patently defines over the cited art for at least the reason that the cited reference fails to teach the features emphasized above.

As is clearly recited in claim 1, the liquid crystal display device in claim 1 comprises **a liquid crystal reverse region (the first space) and a liquid crystal non-reverse region (the second space).** Significantly, **the first space is larger than the second space.**

In contrast, as set forth above in the discussion of rejections under 35 U.S.C. 102, Applicant noted that Yee does not teach or otherwise disclose that a liquid crystal display device comprises a liquid crystal reverse region and a liquid crystal non-reverse region. Applicant also noted that **APA does not teach or otherwise disclose that a liquid crystal display device comprises a liquid crystal reverse region and a liquid crystal non-reverse region.**

Therefore, neither Yee nor APA teaches or reasonably suggests these features. Therefore, Applicant respectfully asserts that the combination of references is legally deficient for rendering these claims unpatentable.

Moreover, Yee teaches that the distances (a2, b2) between the pixel electrodes 132 and data

line 124 can be **kept uniform** for the purpose of improving the overlay property of the photolithographic masking (paragraph 0038, last six lines). As the combination of APA and Yee does not teach or suggest that **the liquid crystal reverse region is larger than the liquid crystal non-reverse region**, this claim is allowable over the cited references. Insofar as claims 2-10 depend from amended claim 1, these claims are also allowable at least by virtue of their dependency.

Likewise, as amended, independent claim 20 recites:

> 20. A fabrication method for a liquid crystal display device, comprising steps of:
> providing a first substrate;
> forming a plurality of scanning bus lines and a plurality of light-shielding layers overlying the first substrate;
> forming a gate insulating layer overlying the first substrate to cover the scanning bus lines and the light-shielding layers;
> forming a plurality of data bus lines overlying the gate insulating layer, in which the data bus lines and the scanning bus lines are arranged in a matrix form to define a plurality of pixel areas;
> forming a plurality of TFT devices in the plurality of pixels, respectively; and
> forming a plurality of pixel electrode layers overlying the passivation layer in the plurality of pixels, respectively;
> wherein, in each pixel area, the pixel electrode layer is formed between a first data bus line and a second data bus line; and
> wherein, in each pixel area, a first space between the first data bus line and a periphery of the pixel electrode layer is ***a liquid crystal reverse region***, and a second space between the second data bus line and a periphery of the pixel electrode is ***a liquid crystal non-reverse region***; and
> wherein, ***the first space is larger than the second space.***

(Emphasis Added). Claim 20 patently defines over the cited art for at least the reason that the cited reference fails to teach the features emphasized above.

As clearly recited in claim 20, the liquid crystal display device in claim 20 comprises **a liquid crystal reverse region (the first space) and a liquid crystal non-reverse region (the second space).** Wherein, **the first space is larger than the second space.**

In contrast, and as set forth in the above discussion of claim 1, **neither Yee nor APA teaches or**

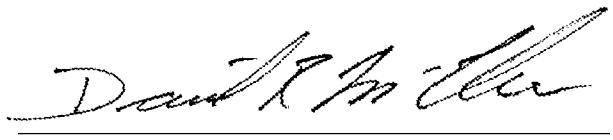
reasonably suggests the limitation that a liquid crystal display device comprises a liquid crystal reverse region and a liquid crystal non-reverse region. Therefore, Applicant respectfully asserts that the combination of references is legally deficient for rendering these claims unpatentable.

Accordingly, it is believed that the amended claim 20 is allowable over the cited reference. Insofar as claims 21-29 depend from amended claim 20, these claims are also allowable at least by virtue of their dependency.

A prompt and favorable action on the merits of this application is now respectfully requested.

No fee is believed to be due in connection with this amendment and response. If, however, any fee is deemed to be payable, you are hereby authorized to charge any such fee to Deposit Account No. 20-0778.

Respectfully submitted,

By: 

Daniel R. McClure, Reg. No. 38,962

Thomas, Kayden, Horstemeyer & Risley, LLP
100 Galleria Pkwy, NW
Suite 1750
Atlanta, GA 30339
770-933-9500